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IoT-ENABLED DRUG CONTENT DETECTION IN COUGH SYRUP

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ABSTRACT

The paper presents an IoT-based system to detect pharmaceutical content levels in cough syrup and prevent accidental exposure to harmful compounds. The system uses near-infrared spectroscopy to assess active pharmaceutical ingredients, and a microcontroller unit (MCU) performs real-time analysis. The system is linked to a cloud platform for remote data transfer and analysis. A user-friendly mobile application allows consumers, healthcare providers, and regulators to access drug content information. While this system enhances safety, enables real-time monitoring, and supports regulatory compliance, challenges like technical complexity and potential cost implications must be addressed.

KEYWORDS: API-Active Pharmaceutical Ingredients, IoT-Internet of Things, MCU-Microcontroller Unit, R&D-Research and Development

INTRODUCTION

Recent occurrences involving children whose lives were tragically cut short after consuming contaminated cough syrup have created an urgent need for innovative methods to ensure the safety of medication. This journal delves into the development and implementation of an Internet of Things-based system designed to detect the level of pharmaceutical content in cough syrup and prevent unintended absorption of harmful chemicals.

BACKGROUND

The tragic death of children from tainted cough syrup rocked society to its foundations and exposed the weaknesses in the drug supply chain. It highlighted the urgent need for a technology-driven strategy that would monitor and confirm the safety of medications prior to ingestion. This idea has been brought up from breath analyzer which is used by police to find drunk and drive and in analyzer it contain MQ sensor to detect alcohol whereas here we are creating a device to detect the level of contamination in syrup..

IOT SOLUTION:

The suggested remedy is incorporating Internet of Things (IoT) gadgets and sensors into the bottles used to package cough medication. These Internet of Things (IoT) devices have cutting-edge sensors that can measure the amount of active pharmaceutical ingredients (APIs) in the syrup. The sensors evaluate the molecular makeup of the liquid using cutting-edge spectroscopic techniques to determine the presence and concentration of the intended medicine.

SYSTEM ARCHITECTURE:

The IoT-enabled drug content detection system consists of the following key components:

1. Sensors: High-precision sensors are incorporated into the device or body. These sensors examine the chemical composition of the liquid using near-infrared spectroscopy.
2. Microcontroller Unit (MCU): Real-time analysis is carried out on the sensor data by an MCU. It verifies the validity and safety of the syrup by comparing the acquired spectral data with previously defined profiles of authorized medications.
3. Wireless Connectivity:Wireless connection methods (such Wi-Fi, Bluetooth, or cellular networks) are used to link the MCU to the cloud. Real-time data transfer and remote monitoring are made possible by this.
4. Cloud Platform:A cloud-based platform receives the data that is transmitted from various IoT devices. Here, complex algorithms analyze the data and produce alarms if the drug content level veers outside of the acceptable range.
5. User Interface: A user-friendly mobile application allows consumers, healthcare providers, and regulatory authorities to access information about the syrup's drug content. Alerts and notifications are sent if any discrepancies are detected.

FUNCTIONALITY:

If this inventory device is nearby when the syrup bottle is opened, the sensors inside the device start the analysis procedure. The liquid is subjected to near-infrared spectroscopy, which records the distinctive molecular signature of the substance. After then, the MCU contrasts this characteristic with the pharmacological profiles of real cough syrups that are kept in its memory. The system verifies the authenticity and notifies the user whether the drug content fits an authorized profile. A quick notice is provided in the event of any inconsistency or probable contamination, stopping ingestion and triggering additional research.

ADVANTAGES:

1. Enhanced Safety: The Internet of Things-based technology works as a safety barrier, prohibiting the intake of tainted or counterfeit cough syrup.
2. Real-time Monitoring:The system gives real-time medication content updates, allowing for quick intervention in the event of an anomaly.
3. Regulatory Compliance:Regulatory authorities can access data to ensure adherence to safety standards, thereby maintaining the integrity of the medication supply chain.
4. Consumer Empowerment: Consumers develop trust in pharmaceutical products due to their increased confidence in the safety of their medications.

DISADVANTAGES

1. Technical Complexity and Reliability:The technical complexity of developing and maintaining a system with high-precision sensors, microcontroller units, wireless connectivity, and cloud platforms can pose challenges, including sensor calibration, integration, and ensuring system reliability.
2. Cost Implications:Incorporating IoT technology into prescription packaging necessitates a substantial investment in R&D, production, and deployment. This cost could be passed on to customers, raising the price of pharmaceuticals. Patients in low-income areas or healthcare systems with insufficient resources may be severely affected.

CONCLUSION

The tragic cases of children's deaths due to contaminated cough syrup highlight the importance of proactive drug safety measures. The IoT-enabled drug content detection system is an innovative solution, requiring collaborations among stakeholders to protect vulnerable society members.